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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/682,411	08/30/2001	Zheng Tang	45283.4	7773

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EXAMINER	
CREPEAU, JONATHAN	
ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 07/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/682,411	TANG ET AL.	
	Examiner	Art Unit	
	Jonathan S. Crepeau	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-20,22 and 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-20,22 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 24, 2006 has been entered.

This Office action addresses claims 11-20, 22, and 23. The claims remain rejected under 35 USC §103 herein. This action is non-final.

Regarding the amendment to claim 22, this amendment is not in the proper format. Double brackets or strikethrough, rather than single brackets, must be used to indicate deletions. If another copy of the claims is submitted, however, this issue will be moot.

Claim Rejections - 35 USC § 103

2. Claims 11, 15-17, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472.

Regarding claims 11 and 15, the reference is directed to a solid oxide fuel cell comprising an electrode layer (2, 3) applied to an electrolyte layer (1). The electrode layer comprises discrete elements separated by substantially uniform gaps (see abstract; Fig. 5). As shown in

Figure 6C, the discrete elements appear to have a generally circular shape and are evenly and uniformly spaced.

JP '472 does not expressly teach that the discrete elements are polygonal in shape, particularly hexagonal, as recited in claims 11, 12, and 15-17, or that such polygons or hexagons have parallel edges.

However, the claimed shapes of the discrete elements are a matter of choice which a person of ordinary skill in the art would have found obvious, absent sufficient evidence to the contrary (MPEP §2144.04 (IV)). As such, the claimed polygonal and hexagonal shapes of the discrete elements are considered to be obvious to a person of ordinary skill in the art.

The reference also does not expressly teach that the gaps between elements take up less than about 5%, 2%, or 1% of the surface area of the electrode, as recited in claims 11, 12, 15, 22, and 23.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be sufficiently motivated to make the gaps as thin as possible in the interest of increasing contact area and decreasing electrical resistance. Accordingly, Applicants' claimed ranges are also not considered to distinguish over the reference. Furthermore, the recitations of linear gaps, uniform gaps, and parallel edges would also be rendered obvious due to the close packing of the hexagonal electrode elements on the electrolyte sheet.

3. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472 as applied to claims 11, 15-17, 22, and 23 above, and further in view of Carolan et al (U.S. Patent 5,750,279).

JP '472 does not expressly teach that a contact paste is coated on the electrode, as recited in claim 18.

Carolan et al. is directed to a solid oxide fuel cell. In column 6, lines 23-28, the reference teaches a conductive paste located between the electrode and interconnector.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the conductive paste of Carolan et al. between the electrode of JP '472 and an interconnector. In column 13, line 41, Carolan teaches that "[t]he conductive material 340, 342 serves to direct electrons from the anode layer 326 to the interconnect layer 316, and from the interconnect layer 316 to the cathode layer 332." Thus, the artisan would be motivated to use the conductive paste of Carolan et al. between the electrode of JP '472 and an interconnector in hopes of improving electrical conductivity (i.e., decreasing electrical resistance) between the two.

4. Claims 12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472 as applied to claims 11, 15-17, 22, and 23 above, and further in view of Ruhl et al (U.S. Patent 6,361,892).

JP '472 further teaches that the electrode layer is made by photo-etching in the abstract. However, the reference does not expressly teach that the electrode is made by screen-printing followed by sintering, as recited in claim 12.

Ruhl et al. is directed to a solid oxide fuel cell comprising an electrode layer applied to an electrolyte layer, which electrode layer comprises discrete elements (see col. 8, lines 39-42; Figs. 2 and 3). The electrode layer may be made by screen printing, etching, or photolithography, among other methods, which can be followed by sintering (see col. 6, line 29; col. 8, line 22 et seq).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Ruhl et al. indicates that screen printing and photolithography (photo-etching) are equivalent methods for fabricating discrete SOFC electrode elements. As such, it would have been obvious to substitute the screen printing process of Ruhl et al. for the photolithographic process of JP '472. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06. Further, the sintering step disclosed by Ruhl would also be an obvious modification of the process of JP '472 because the solid oxide fuel cell of JP '472 would be operated at a high temperature that would require sintering of the components.

5. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472 in view of Ruhl et al. as applied to claims 12 and 14 above, and further in view of Carolan et al (U.S. Patent 5,750,279).

JP '472 does not expressly teach that a contact paste is coated on the electrode, as recited in claim 13.

Carolan et al. is directed to a solid oxide fuel cell. In column 6, lines 23-28, the reference teaches a conductive paste located between the electrode and interconnector.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the conductive paste of Carolan et al. between the electrode of JP '472 and an interconnector (separator). In column 13, line 41, Carolan teaches that "[t]he conductive material 340, 342 serves to direct electrons from the anode layer 326 to the interconnect layer 316, and from the interconnect layer 316 to the cathode layer 332." Thus, the artisan would be motivated to use the conductive paste of Carolan et al. between the electrode of JP '472 and an interconnector in hopes of improving electrical conductivity (i.e., decreasing electrical resistance) between the two.

6. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472 in view of Carolan et al. as applied to claim 18 above, and further in view of Singh et al (U.S. Patent 5,516,597).

Carolan et al. further teach that the conductive material may be formed from an electrode material (see col. 6, line 26). However, Carolan et al. do not expressly teach that the conductive material is lanthanum cobaltate, as recited in claim 19.

Singh et al. is directed to a solid oxide fuel cell. In column 6, line 52, Singh et al. teach the following:

> niques. The air electrode is typically comprised of doped and undoped mixtures of metal oxides such as $LaMnO_3$, $CaMnO_3$, $LaNiO_3$, $LaCoO_3$, $LaCrO_3$ and other electrically conducting metal oxides. The dopants are typically Sr, Ca, Co, Ni, Fe, Sn, Ba, Ce or the like. The preferred air electrode

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by Singh et al. to use lanthanum cobaltate as the conductive material of Carolan et al. Carolan et al. disclose that a suitable material is electrically conductive or an electrode material. In the passage above, Singh et al. identify $LaCoO_3$ as being electrically conducting and an electrode material. The selection of a known material based on its suitability for its intended use has been held to be *prima facie* obvious (MPEP §2144.07). Thus, the artisan would have been sufficiently skilled to use $LaCoO_3$ as the conductive material of Carolan et al.

Response to Arguments

7. Applicant's arguments filed April 24, 2006 have been fully considered but they are not persuasive. Applicants state that "it is mathematically impossible to obtain gaps between discrete elements of less then 5% of the surface area of the electrode, using circular shaped dots." While this assertion may have merit, the Examiner's statements with regard to changing the shape of the dots from circles to hexagons remains applicable. It is still believed that such a change in shape is a matter of design choice. Applicant is invited to make a showing that hexagonal or polygonal elements perform unexpectedly better than circular elements, i.e., that the polygonal shape of the elements is critical to the practice of the present invention. Further, the Examiner's position with regard to reducing the gaps between elements is also maintained. Applicant urges that "one skilled in the art would also be motivated to avoid gaps of less then 5% of the surface area of the electrode, to avoid an increased gas diffusion related over-potential which would more than offset the decreasing electrical resistance." It is acknowledged that the manipulation of the size of the gaps involves optimization between potentially conflicting factors. However, it is submitted that there would be a reasonable expectation of success in making the gap area less than 5% of the total area. Further, Applicant's statement implies that such small gaps would provide a prohibitively large resistance to gas diffusion. However, as set forth in the previous Office action, the electrode elements per se of the reference are not inherently non-porous (i.e., the gas can reach the interface both *through* and *around* the electrode elements). As such, it is not apparent that one skilled in the art would weigh this factor heavily when considering optimization of the electrode elements of the reference. Therefore, the subject

matter of the independent claims is still believed to be obvious over the JP '472 reference as stated above.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan, can be reached at (571) 272-1292. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jonathan Crepeau
Primary Examiner
Art Unit 1745
July 6, 2006